



MICHIGAN DEPARTMENT OF NATURAL RESOURCES
Wildlife Division Report No. 3477
October 2007

Printed by Authority of: P.A. 451 of 1994
Total Number of Copies Printed:25
Cost per Copy:.....\$1.61
Total Cost:\$40.25

Michigan Department of Natural Resources

2006 WATERFOWL HARVEST SURVEY

Brian J. Frawley

ABSTRACT

A sample of waterfowl hunters was contacted after the 2006 hunting seasons to estimate hunting activity and determine opinions and satisfaction with hunting regulations. In 2006, about 50,200 people hunted waterfowl. The number of people hunting ducks and geese was unchanged between 2005 and 2006, although license sales increased by 1%. Compared to 2005, an increased proportion of duck and goose hunters in 2006 were satisfied with their overall hunting experience (57 versus 50% satisfaction among duck hunters and 55 versus 49% satisfaction among goose hunters). Goose hunters were asked their opinion on the use of various methods to control goose numbers in areas where human-goose conflict was a problem and hunting was not possible. The method receiving the highest level of support was relocating geese from problem areas to areas where hunting is more likely (67% approval). The next most popular methods were killing the geese and processing them for human consumption (50% approval) and flushing geese from problem areas to eliminate reproduction (46% approval). The least preferred methods were feeding geese a dietary supplement to reduce reproduction (3% approval) or killing problem geese and burying their carcasses (2% approval). Duck and goose hunters spent an average of \$421 for waterfowl hunting trips in Michigan during 2006. Collectively, waterfowl hunters spent \$21.7 million on waterfowl hunting trips in Michigan.

INTRODUCTION

The Michigan Natural Resources Commission and Department of Natural Resources (DNR) have authority and responsibility to protect and manage wildlife resources in the state of Michigan. This responsibility is shared with the U.S. Fish and Wildlife Service (USFWS) and other state and provincial wildlife management agencies for the management of migratory birds such as ducks (Anatinae) and geese (*Branta* and *Anser* spp.). Harvest surveys are one



A contribution of Federal Aid in Wildlife Restoration, Michigan Project W-147-R

Equal Rights for Natural Resource Users

The Michigan Department of Natural Resources (MDNR) provides equal opportunities for employment and access to Michigan's natural resources. Both State and Federal laws prohibit discrimination on the basis of race, color, national origin, religion, disability, age, sex, height, weight or marital status under the Civil Rights Acts of 1964, as amended (MI PA 453 and MI PA 220, Title V of the Rehabilitation Act of 1973 as amended, and the Americans with Disabilities Act). If you believe that you have been discriminated against in any program, activity, or facility, or if you desire additional information, please write the MDNR, HUMAN RESOURCES, PO BOX 30028, LANSING MI 48909-7528, or the MICHIGAN DEPARTMENT OF CIVIL RIGHTS, STATE OF MICHIGAN PLAZA BUILDING, 1200 6TH STREET, DETROIT MI 48226, or the OFFICE FOR DIVERSITY AND CIVIL RIGHTS, US FISH AND WILDLIFE SERVICE, 4040 NORTH FAIRFAX DRIVE, ARLINGTON VA 22203.

For information or assistance on this publication, contact: MDNR, WILDLIFE DIVISION, P.O. BOX 30444, LANSING, MI 48909-7944, -or- through the internet at " <http://www.michigan.gov/dnr> ". This publication is available in alternative formats upon request. TTY/TTD (teletype): 711 (Michigan Relay Center).

of the management tools used by the Wildlife Division in formulating proposed regulations. Estimating harvest and hunting effort are among the primary objectives of these surveys. Estimates derived from harvest surveys, as well as breeding bird abundance and population models, are used to develop harvest regulations that provide sustainable recreational hunting and viewing opportunities of migratory game birds. Wildlife management agencies also consider hunter opinions and desires when establishing regulations.

Waterfowl could be harvested during hunting seasons that occurred September 1, 2006, through January 29, 2007, (Table 1) by a person possessing both a waterfowl and a small game hunting license (includes resident, nonresident, 3-day nonresident, resident junior, and senior small game hunting licenses). Waterfowl hunters also had to obtain a federal waterfowl stamp and to register with the National Migratory Bird Harvest Information Program (HIP). Hunters younger than 16 years of age could hunt waterfowl without a waterfowl hunting license or a federal waterfowl stamp; however, they still were required to purchase a small game license and register with the HIP.

The HIP is a cooperative effort between state wildlife agencies and the USFWS. It was implemented to improve knowledge about harvest of migratory game birds (e.g., ducks, geese, and woodcock [*Scolopax minor*]). Beginning in 1995, any person who hunted migratory game birds in Michigan was required to register with the HIP and answer several questions about their hunting experience during the previous year. The HIP provided the USFWS with a national registry of migratory bird hunters from which they can select participants for harvest surveys.

State wildlife agencies select specific regulations, such as hunting season dates, within overall frameworks (e.g., number of days of hunting and bag limits) set by the USFWS. Both waterfowl population status and hunter attitudes are used when developing Michigan waterfowl hunting regulations. Although estimating harvest, hunter numbers, and hunting effort were the primary objectives of the waterfowl harvest survey, this survey also provided an opportunity to collect information about management issues. Questions were added to the questionnaire to estimate hunters' opinions and satisfaction with hunting regulations and waterfowl numbers. Questions were also added to estimate annual waterfowl hunting trip expenditures.

METHODS

Following the 2006 hunting seasons, a questionnaire was sent to 5,981 randomly selected people that were eligible to hunt waterfowl in Michigan. The people selected were grouped into one of two strata on the basis of their age, licenses purchased, and whether they had registered with the HIP. The first stratum consisted of people at least 16 years old that had purchased a waterfowl hunting license. The second stratum consisted of people less than 16 years old that had registered with the HIP. The sample consisted of 4,748 people from the first stratum (N=60,286) and 1,233 people from the second stratum (N=16,246).

Questionnaires were mailed initially in mid-March. Up to two follow-up questionnaires were sent to non-respondents. Questionnaires were undeliverable to 145 people, primarily

because of changes in residence. Questionnaires were returned by 3,713 of 5,836 people receiving the questionnaire (64% response rate).

Estimates were calculated using a stratified random sampling design (Cochran 1977). Using stratification, hunters were placed into similar groups (strata) based on their age, licenses purchased, and whether they had registered with the HIP. Then estimates were derived for each group separately. The statewide estimate was then derived by combining group estimates so the influence of each group matched the proportion its members occurred in the statewide population of hunters. The primary reason for using a stratified sampling design was to produce more precise estimates. Improved precision means similar estimates should be obtained if this survey were to be repeated.

Estimates were derived separately for the Upper Peninsula (UP), northern Lower Peninsula (NLP), and southern Lower Peninsula (SLP)(Figure 1). Estimates were also calculated separately for duck and goose management zones. Hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest. Estimates were calculated along with their 95% confidence limit (CL). In theory, this confidence limit can be added and subtracted from the estimate to calculate the 95% confidence interval. The confidence interval is a measure of the precision associated with the estimate and implies the true value would be within this interval 95 times out of 100. Unfortunately, there are several other possible sources of error in surveys that are probably more serious than theoretical calculations of sampling error. They include failure of participants to provide answers (nonresponse bias), question wording, and question order. It is difficult to measure these biases. Thus, estimates were not adjusted for possible bias. Furthermore, harvest estimates did not include animals taken legally outside the open season (e.g., nuisance animals).

Statistical tests are used routinely to determine the likelihood the differences among estimates are larger than expected by chance alone. The overlap of 95% confidence intervals was used to determine whether estimates differed. Non-overlapping 95% confidence intervals was equivalent to stating the difference between the means was larger than would be expected 995 out of 1,000 times ($P < 0.005$), if the study had been repeated (Payton et al. 2003).

RESULTS

License sales and hunter participation

In 2006, 60,401 people purchased a state waterfowl hunting license (Table 2). The average age of people that purchased a waterfowl hunting license was 42 years (Figure 2). About 2% (1,097) of waterfowl license buyers were younger than 17 years old. Hunters 10-15 years of age could legally hunt waterfowl without a waterfowl hunting license; thus, the count of youth license buyers failed to count all youth waterfowl hunters. About 98% of the waterfowl hunting license buyers were males.

An estimated 50,230 people went afield to hunt waterfowl in 2006 (Table 3). The mean age of the active waterfowl hunter was 40 years, and about 11% of the active hunters were less

than 17 years old (5,471 youth hunters). About $66 \pm 1\%$ of the people eligible to hunt waterfowl spent time hunting ducks or geese. About $76 \pm 1\%$ of the people that had purchased a waterfowl hunting license (stratum 1) stated they hunted. In contrast, $41 \pm 4\%$ of the people less than 16 years old that had registered with the HIP (stratum 2) hunted waterfowl. About $37 \pm 1\%$ ($28,408 \pm 1,132$) of those eligible to hunt waterfowl attempted hunting both ducks and geese. An estimated 42,068 duck hunters spent 346,137 days afield; while an estimated 36,570 goose hunters spent 280,207 days afield (Tables 4-9).

Harvest and hunting trends

Annual comparisons of season segments are difficult to interpret because lengths of hunting season segments and hunting zones often change annually and hunting zones and stratification zones do not coincide (Figure 1). The combined totals from all segments of the season are more appropriate for annual comparisons. The number of active hunters, amount of effort spent hunting, and ducks and geese harvested statewide was not significantly different between 2005 and 2006 (Tables 4-9).

Hunter opinions

An estimated 57% of the Michigan duck hunters were satisfied with their duck hunting experience in 2006, 19% had a neutral opinion about their experience, while 22% of duck hunters were dissatisfied (Table 10). Satisfaction among goose hunters with the goose hunting seasons was similar to the satisfaction levels reported for duck hunting.

Nearly 50% of Michigan duck hunters were satisfied with the 2006 duck hunting season dates, length of the duck season, and the daily duck limit (Table 10). About 48% of the duck hunters reported they were satisfied with the number of ducks seen in 2006, but only 32% of duck hunters were satisfied with the number of ducks harvested. Similarly, about 62% of goose hunters were satisfied with the number of geese seen in 2006, but only 37% of goose hunters were satisfied with the number of geese harvested.

Goose hunters were presented seven options for helping alleviate conflicts between geese and people in areas where hunting has not been effective, and they were asked to indicate how much they approve or disapprove of these methods. The seven methods included: (1) round up and kill problem geese and process for human consumption, (2) round up and kill problem geese and bury the carcasses, (3) flush (haze) geese from problem areas to eliminate on-site reproduction, (4) round up and move geese from problem sites to other areas in Michigan where hunting is more likely to occur, (5) destroy nests and eggs of geese in problem areas, (6) feed problem geese food supplements that prevent goose eggs from hatching, and (7) let the Federal government decide how to handle problems with geese. The method receiving the highest level of support was relocating geese from problem areas to areas where hunting is more likely (Table 11). The next most popular methods were killing the geese and processing them for human consumption and flushing geese from problems to eliminate reproduction. The least preferred methods among goose hunters were killing problem geese and burying their carcasses or feeding geese a dietary supplement to reduce reproduction.

Waterfowl hunting expenditures

Among waterfowl hunters (duck and goose hunters combined) that participated in 2006, the average hunter devoted 7.6 ± 0.4 hunting trips during the year to hunt waterfowl. The trips included hunts that took place during a single day and hunts that required an overnight stay away from home. All waterfowl hunters combined took $389,878 \pm 21,038$ waterfowl hunting trips in Michigan during 2006. Among hunters that reported their expenditures, active hunters spent an average of $\$421 \pm \34 per year on hunting trips. Expenditures on long trips included the costs of food, travel, and lodging, while short trips may have only included the cost of fuel. Collectively, waterfowl hunters spent $\$21.7$ million ($\pm \$1.6$ million) on hunting trips primarily to hunt waterfowl in Michigan during 2006.

DISCUSSION

Since 1954, the highest numbers of duck and goose hunters recorded in Michigan occurred in 1970 (Figure 3). From this peak, the current number of people hunting ducks has declined 70% (average annual decline = 4.0%), while the number of people hunting geese has declined 44% (average annual decline = 2.0%). Declining numbers of small game hunters, including waterfowl hunters, has been noted previously in Michigan and throughout the United States since the mid-1970s (Enck et al. 2000, U.S. Department of the Interior 2002, Aiken 2004, Frawley 2006). Between 2001 and 2006, the number of hunters pursuing migratory birds declined 22% nationally (U.S. Department of the Interior 2007). Similarly, the number of people hunting ducks in the regular duck hunting season declined an estimated 21% in Michigan during this same period. Many factors are responsible for declining waterfowl hunter numbers including loss of waterfowl habitat, increased urbanization of the human population, increased competition between hunting and other leisure activities, and decreased access to private land for hunting. Although the number of duck hunters and duck harvest has decreased since 1970, duck harvest per day of hunting effort has increased (Figure 4). Goose harvest and the mean number of geese taken per day of hunting effort also have increased gradually since the 1970s (Figure 4).

Compared to 2005 (Frawley 2007), an increased proportion of duck hunters in 2006 were satisfied with their overall duck hunting experience (57% versus 50% satisfied). Moreover, an increased proportion of duck hunters were satisfied with the number of ducks seen (48% versus 38%), ducks harvested (32% versus 25%), and hunting season dates (49% versus 42%). Goose hunters also reported increased satisfaction with their overall goose hunting experience (55% versus 49%). Furthermore, goose hunters reported increased satisfaction with the number of geese seen (62% versus 54%) and geese harvested (37% versus 31%).

The number of Canada geese that nest or reside predominantly within Michigan (resident Canada geese) has increased during the last 25 years and peaked during 2000. Despite, lower numbers of geese in Michigan now compared to 2000, conflicts between these geese and people have remained relatively high. If Michigan's goose population grows too large, alternative strategies to manage conflicts between Canada geese and people may be needed. Goose hunters have been asked periodically their opinion on the use of various techniques to control goose numbers in urban areas where human-goose conflict was a problem and hunting was not effective (Soulliere and Frawley 2001, Frawley and Soulliere

2005, Frawley 2007). In these situations, most goose hunters ($\geq 52\%$) have supported killing adult geese and donating the meat to families in need as an option for reducing goose numbers (Figure 5). Goose hunters have been less supportive of the destroying the goose nests in areas with problem geese, and the level of support in 2006 was the lowest recorded (21%, Figure 6). Most goose hunters ($\geq 64\%$) have consistently disapproved of controlling goose populations using dietary supplements that could reduce their reproduction (Figure 7).

Nationally, waterfowl hunters spent an average of \$541 on waterfowl hunting in 2001 (Henderson 2005). These expenses included both trip-related and equipment expenditures. The trip-related expenses were about \$275 per waterfowl hunter nationally in 2001. In contrast, Michigan waterfowl hunters spent an estimated \$421 for trip-related expenses in 2006. Although, the trip-related expenditures have likely increased over time (e.g., fuel prices), differences between the national and state estimates could also result from different scale of estimation and different methods used to collect data.

ACKNOWLEDGEMENTS

I thank all the hunters that provided information. Autumn Feldpausch, Theresa Riebow, and Becky Walker completed data entry. Marshall Strong created Figure 1. Mike Bailey, Valerie Frawley, Jennifer Kleitch, Dave Luukkonen, Cheryl Nelson-Fliearman, and Doug Reeves reviewed a draft version of this report.

LITERATURE CITED

- Aiken, R. 2004. Fishing and hunting 1991-2001: avid, casual, and intermediate participation trends. Report 2001-5. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C., USA.
- Cochran, W. G. 1977. Sampling techniques. John Wiley & Sons, New York. USA.
- Enck, J. W., D. J. Decker, and T. L. Brown. 2000. Status of hunter recruitment and retention in the United States. Wildlife Society Bulletin 28:817-824.
- Frawley, B. J. and G. J. Soulliere. 2005. Michigan waterfowl hunter activity and opinions on regulations, management, and satisfaction following the 2002-03 hunting seasons. Wildlife Division Report 3443. Michigan Department of Natural Resources, Lansing, USA.
- Frawley, B. J. 2006. Demographics, recruitment, and retention of Michigan hunters: 2005 update. Wildlife Division Report 3462. Michigan Department of Natural Resources, Lansing, USA.
- Frawley, B. J. 2007. 2005 waterfowl harvest survey. Wildlife Division Report 3466. Michigan Department of Natural Resources, Lansing, USA.

- Henderson, E. 2005. Economic impact of waterfowl hunting in the United States. Addendum to the 2001 national survey of fishing, hunting, and wildlife-associated recreation. Report 2001-9. U.S. Department of the Interior, Washington, D.C., USA.
- Payton, M. E., M. H. Greenstone, and N. Schenker. 2003. Overlapping confidence intervals or standard error intervals: what do they mean in terms of statistical significance? *Journal of Insect Science* 3:34.
- Soulliere, G. J. and Frawley, B. J. 2001. Michigan waterfowl hunter activity and opinions on regulations, management, and satisfaction, 1998-1999. Wildlife Division Report 3357. Michigan Department of Natural Resources, Lansing, USA.
- U.S. Department of the Interior. 2002. 2001 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Bureau of the Census, Washington, D.C., USA.
- U.S. Fish and Wildlife Service. 2007. 2006 national survey of fishing, hunting, and wildlife-associated recreation, national overview: preliminary estimates. U.S. Department of the Interior, Washington, D.C., USA.

Table 1. Waterfowl hunting seasons in Michigan, 2006-2007.

Species, season, and area ^a	Season dates
Ducks ^b	
North Zone (UP)	Sept. 30 – Nov. 28
Middle Zone	Sept. 30 – Nov. 26 and Dec. 2 – 3
South Zone	Oct. 7 – Dec. 3 and Dec. 31 – Jan. 1
Canada geese ^{b,c}	
Early seasons	
Upper Peninsula	Sept. 1 – 10
Lower Peninsula	Sept. 1 – 15
Regular seasons	
UP Mississippi Valley Population Unit	Sept. 18 – Nov. 6
LP Mississippi Valley Population Unit	Sept. 30 – Oct. 29 and Nov. 23 – Dec. 12
LP Southern James Bay Population Unit	Oct. 7 – 16 and Nov. 23 – Dec. 12
Late season	
Southern Lower Peninsula	Dec. 31 – Jan. 29

^aSee Figure 1 for boundaries of hunt areas.

^bDucks and geese could also be taken during a special 2-day Youth Season (September 16-17).

^cSpecial goose hunting seasons also occurred on Goose Management Units, but these seasons affected a relatively small area.

Table 2. Number of waterfowl hunting licenses sold in Michigan, 2002-2006.

Item	Year					2005-2006 % Change
	2002	2003	2004	2005	2006	
Number of licenses sold ^a	65,050	65,457	63,320	60,234	60,994	1.3
Number of people buying a hunting license ^{b,c}	64,582	65,024	62,738	59,658	60,401	1.2

^aThe number of licenses sold is higher than the number of people buying licenses because some people purchased multiple licenses.

^bA person was counted only once, regardless of how many licenses they purchased.

^cHunters 10-15 years of age could legally hunt waterfowl without a waterfowl hunting license.

Table 3. Estimated number, sex, and age of active waterfowl hunters, and proportion and number of youth waterfowl hunters in Michigan, 2002-2006.^a

Hunters	2002	2003	2004	2005 ^b	2006	
					Estimate	95% CL
Waterfowl ^c	58,944	60,805	58,422	50,431	50,230	1,073
Males (%)	97.8	97.5	98.2	97.2	97.1	0.7
Females (%)	2.2	2.5	1.8	2.8	2.9	0.7
Age (Years)	39.2	39.7	39.6	40.4	40.4	0.6
Youth (%) ^d	9.2	9.7	NA ^e	10.7	10.9	1.1
Youth (No.) ^d	5,396	5,922	NA	5,389	5,471	587

^aAnalyses included only those people that hunted.

^bEstimates of age and sex of hunters for 2005 was incorrectly reported previously (Frawley 2007).

^cPeople that hunted ducks or geese.

^dHunters 10-16 years of age.

^eNot available.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2005 and 2006 (P<0.005).

Table 4. Estimated number of waterfowl hunters by season and region in Michigan, 2003-2006.^a

Species and area (stratum)	2003	2004	2005	2006		2005-2006 % Change
				No.	95% CL	
Ducks (First split)						
UP	7,295	7,987	6,654	5,555	606	-17
NLP	19,086	19,788	16,218	18,351	1,001	13*
SLP	28,278	27,831	22,704	22,761	1,070	0
Statewide	48,992	48,881	40,525	41,102	1,149	1
Ducks (Second split)						
UP						
NLP	2,357	1,652	6,399	2,838	440	-56*
SLP	9,777	8,011	9,628	9,147	755	-5
Statewide	12,096	9,618	15,421	11,886	853	-23*
Ducks (Seasons combined)						
UP	7,308	8,142	6,696	5,578	606	-17
NLP	19,553	20,364	17,883	18,634	1,005	4
SLP	29,755	29,494	24,218	23,915	1,085	-1
Statewide	50,455	50,330	42,660	42,068	1,147	-1
Geese (Early season)						
UP	2,600	2,484	2,013	1,663	342	-17
NLP	7,558	7,865	7,875	8,015	720	2
SLP	16,088	15,844	13,603	13,800	901	1
Statewide	25,474	25,216	22,944	22,747	1,073	-1
Geese (Regular season)						
UP	4,859	4,019	3,643	3,075	459	-16
NLP	10,775	9,694	9,448	10,022	786	6
SLP	15,895	16,246	13,223	15,015	928	14
Statewide	30,171	28,815	25,207	26,934	1,113	7
Geese (Late season)						
UP						
NLP	1,043	605	1,057	950	259	-10
SLP	9,408	8,141	8,313	9,813	779	18
Statewide	10,373	8,687	9,192	10,723	822	17
Geese (Seasons combined)						
UP	5,734	5,255	4,334	3,611	494	-17
NLP	13,988	13,357	12,809	13,456	888	5
SLP	25,331	25,235	20,395	22,210	1,059	9
Statewide	42,024	40,394	34,726	36,570	1,159	5

^aThe number of hunters does not add up to the statewide total because hunters can hunt in more than one region.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2005 and 2006 (P<0.005).

Table 5. Estimated amount of waterfowl hunter effort (days afield) by season and region, 2003-2006.

Species and area (stratum)	2003	2004	2005 ^a	2006		2005- 2006 % Change
				No.	95% CL	
Ducks (First split)						
UP	49,500	50,977	46,678	32,366	5,079	-31*
NLP	125,430	140,167	84,778	122,187	10,964	44*
SLP	184,763	198,688	161,176	167,286	12,299	4
Statewide	359,693	389,831	292,632	321,838	16,085	10
Ducks (Second split)						
UP						
NLP	3,802	2,591	30,417	5,841	787	-81*
SLP	14,708	12,577	16,693	18,459	1,269	11
Statewide	18,510	15,167	47,110	24,299	11,444	-48*
Ducks (Seasons combined)						
UP	49,517	51,001	46,809	32,951	5,079	-30*
NLP	129,249	142,793	114,904	128,839	11,278	12
SLP	199,437	211,204	178,029	184,347	12,932	4
Statewide	378,203	404,998	339,741	346,137	20,232	2
Geese (Early season)						
UP	9,933	9,014	6,548	5,471	1,391	-16
NLP	28,020	31,670	30,532	31,725	3,778	4
SLP	64,401	63,975	55,699	54,256	4,603	-3
Statewide	102,355	104,659	92,779	91,453	5,867	-1
Geese (Regular season)						
UP	30,456	21,899	21,676	16,676	3,373	-23
NLP	52,377	48,667	45,223	55,009	6,549	22
SLP	69,092	72,173	59,751	75,221	6,968	26*
Statewide	151,925	142,739	126,650	146,907	9,777	16*
Geese (Late season)						
UP						
NLP	2,794	2,975	3,012	3,304	1,382	10
SLP	34,390	31,215	33,497	38,544	4,620	15
Statewide	37,184	34,190	36,509	41,847	4,903	15
Geese (Seasons combined)						
UP	40,390	30,726	28,187	22,169	4,225	-21
NLP	83,185	83,132	78,818	90,171	9,760	14
SLP	167,890	167,731	148,934	167,866	13,221	13
Statewide	291,464	281,588	255,938	280,207	16,189	9

^aEstimates for the individual duck and goose season segments were incorrectly reported in the 2005 report (Frawley 2007), although the estimates for the combined seasons were reported correctly.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2005 and 2006 (P<0.005).

Table 6. Estimated waterfowl harvest by season and region in Michigan, 2003-2006.

Species and area (stratum)	2003	2004	2005 ^a	2006		2005- 2006 % Change
				No.	95% CL	
Ducks (First split)						
UP	55,296	44,098	40,274	38,194	7,108	-5
NLP	163,060	137,856	109,941	168,993	20,337	54*
SLP	210,061	190,955	178,186	183,215	17,803	3
Statewide	428,417	372,908	328,401	390,401	27,682	19*
Ducks (Second split)						
UP						
NLP	5,772	3,415	30,569	7,978	1,789	-74*
SLP	19,210	19,121	25,848	22,491	2,900	-13
Statewide	24,982	22,536	56,417	30,468	5,113	-46*
Ducks (Seasons combined)						
UP	55,336	44,182	40,321	38,425	7,108	-5
NLP	168,879	141,426	140,431	177,375	21,037	26
SLP	229,185	209,837	204,067	205,069	19,281	0
Statewide	453,399	395,444	384,819	420,869	29,428	9
Geese (Early season)						
UP	10,444	6,347	4,817	3,426	1,171	-29
NLP	22,619	23,587	32,138	30,707	4,682	-4
SLP	59,135	57,237	54,435	52,539	5,927	-3
Statewide	92,198	87,171	91,390	86,672	7,545	-5
Geese (Regular season)						
UP	23,667	9,264	10,178	7,336	1,842	-28
NLP	24,658	21,950	27,524	32,717	5,255	19
SLP	34,034	35,710	40,177	40,830	4,972	2
Statewide	82,359	66,924	77,880	80,883	7,480	4
Geese (Late season)						
UP						
NLP	2,246	2,510	2,170	1,909	954	-12
SLP	26,497	17,663	22,395	23,049	4,057	3
Statewide	28,743	20,174	24,566	24,957	4,200	2
Geese (Seasons combined)						
UP	34,137	15,477	14,893	10,743	2,626	-28
NLP	49,522	47,877	61,827	65,314	9,164	6
SLP	119,641	110,915	117,115	116,456	12,091	-1
Statewide	203,300	174,269	193,836	192,513	15,207	-1

^aEstimates for the individual duck and goose season segments were incorrectly reported in the 2005 report (Frawley 2007), although the estimates for the combined seasons were reported correctly.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2005 and 2006 ($P < 0.005$).

Table 7. Estimated number of duck hunters, hunting effort, and ducks harvested by season and management zone in Michigan, 2006.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
First split						
North	5,734	617	33,077	5,099	38,851	7,136
Middle	11,726	844	69,821	8,153	81,291	12,858
South	29,181	1,134	218,939	13,793	270,260	23,403
Statewide	41,102	1,149	321,838	16,085	390,401	27,682
Second split						
North	0	0	0	0	0	0
Middle	1,800	353	3,655	591	5,014	1,407
South	10,205	795	20,645	1,324	25,455	3,158
Statewide	11,886	853	24,299	11,444	30,468	5,113
Seasons combined						
North	5,755	617	33,679	5,099	39,048	7,136
Middle	11,957	849	73,865	8,405	86,391	13,565
South	30,400	1,143	238,593	14,395	295,429	24,699
Statewide	42,068	1,147	346,137	20,232	420,869	29,428

^aEstimates for the zones do not equal estimates for the areas in Tables 4-6 because hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest.

Table 8. Estimated number of goose hunters, hunting effort, and geese harvested by season and management zone in Michigan, 2006.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Early						
North	1,840	342	6,119	1,391	3,866	1,171
Middle	3,981	497	15,847	2,593	14,328	3,001
South	17,585	951	69,488	4,900	68,478	6,429
Statewide	22,747	1,073	91,453	5,867	86,672	7,545
Regular						
North	3,413	459	18,523	3,373	8,374	1,842
Middle	5,036	549	27,495	4,608	17,137	4,043
South	19,917	990	100,888	7,575	55,372	5,288
Statewide	26,934	1,113	146,907	9,777	80,883	7,480
Late						
North	0	0	0	0	0	0
Middle	0	0	0	0	0	0
South	10,802	788	41,847	4,629	24,957	4,063
Statewide	10,723	822	41,847	4,903	24,957	4,200

^aEstimates for the zones do not equal estimates for the areas in Tables 4-6 because hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest.

Table 9. Estimated number of goose hunters, hunting effort, and geese harvested by season and management zone in Michigan, 2006.

Season and goose zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Early						
Upper Peninsula MVP ^b	1,753	342	5,769	1,391	3,608	1,171
Lower Peninsula MVP	10,468	788	42,444	4,145	40,638	5,188
Lower Peninsula SJBP ^c	11,145	811	43,240	4,105	42,426	5,366
Statewide	22,747	1,073	91,453	5,867	86,672	7,545
Regular						
Upper Peninsula MVP	3,248	459	17,486	3,373	7,778	1,842
Lower Peninsula MVP	12,466	844	71,494	7,450	40,994	5,708
Lower Peninsula SJBP	12,433	844	57,926	5,579	32,112	4,042
Statewide	26,934	1,113	146,907	9,777	80,883	7,480
Late						
Upper Peninsula MVP	0	0	0	0	0	0
Lower Peninsula MVP	4,852	561	20,635	3,299	10,823	2,486
Lower Peninsula SJBP	6,009	619	21,212	3,445	14,134	3,316
Statewide	10,723	822	41,847	4,903	24,957	4,200

^aEstimates for the zones do not equal estimates for the areas in Tables 4-6 because hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest.

^bMississippi Valley Population (MVP).

^cSouthern James Bay Population (SJBP).

Table 10. Level of satisfaction among waterfowl hunters with the 2005 and 2006 waterfowl hunting seasons and hunting regulations in Michigan (summarized as the proportion of active waterfowl hunters reporting various levels of satisfaction).^a

Hunting experience or regulation	Level of satisfaction and year											
	Very satisfied or somewhat satisfied			Neutral			Somewhat dissatisfied or strongly dissatisfied			No answer		
	2005		2006	2005		2006	2005		2006	2005		2006
			95%			95%			95%			95%
	%	%	CL	%	%	CL	%	%	CL	%	%	CL
Ducks seen	38	48*	2	18	21	2	39	31*	2	5	1*	<1
Ducks harvested	25	32*	2	21	25	2	49	42*	2	5	2*	1
Geese seen	54	62*	2	17	17	2	23	20	2	6	2*	1
Geese harvested	31	37*	2	22	21	2	41	40	2	6	2*	1
Duck hunting experience	50	57*	2	19	19	2	25	22	2	6	2*	1
Goose hunting experience	49	55*	2	21	22	2	23	21	2	7	3*	1
Duck season dates	42	49*	2	25	26	2	26	23	2	7	3*	1
Length of duck season	48	53*	2	26	25	2	21	20	2	6	2*	1
Daily duck limit	54	56	2	28	29	2	12	13	1	6	2*	1

^aEstimates associated with duck hunting were derived from answers provided by people that had hunted ducks, while estimates associated with goose hunting were derived from answers received from people that had hunted geese.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2005 and 2006 (P<0.005).

Table 11. Proportion of goose hunters that approved or disapproved of various methods for reducing goose numbers in areas where hunting cannot be used to reduce goose numbers in Michigan (summarized as the proportion of active goose hunters reporting their approval or disapproval).^a

Method	Strongly approve		Approve		Not sure		Disapprove		Strongly disapprove		No answer	
	95%		95%		95%		95%		95%		95%	
	%	CL	%	CL	%	CL	%	CL	%	CL	%	CL
Kill and process for food	21	2	30	2	16	2	14	2	17	2	4	1
Kill and bury carcasses	1	0	2	1	4	1	15	2	74	2	5	1
Haze geese	13	2	33	2	23	2	14	2	12	1	4	1
Relocate geese	29	2	38	2	14	2	9	1	7	1	4	1
Destroy nests	5	1	15	2	18	2	22	2	35	2	4	1
Feed dietary supplements	1	0	2	1	9	1	28	2	55	2	4	1
Let USFWS decide fate	8	1	19	2	34	2	17	2	18	2	4	1

^aProportions do not match proportions in Figures 5-7 because hunters that failed to provide an answer were excluded from estimates presented in the figures.

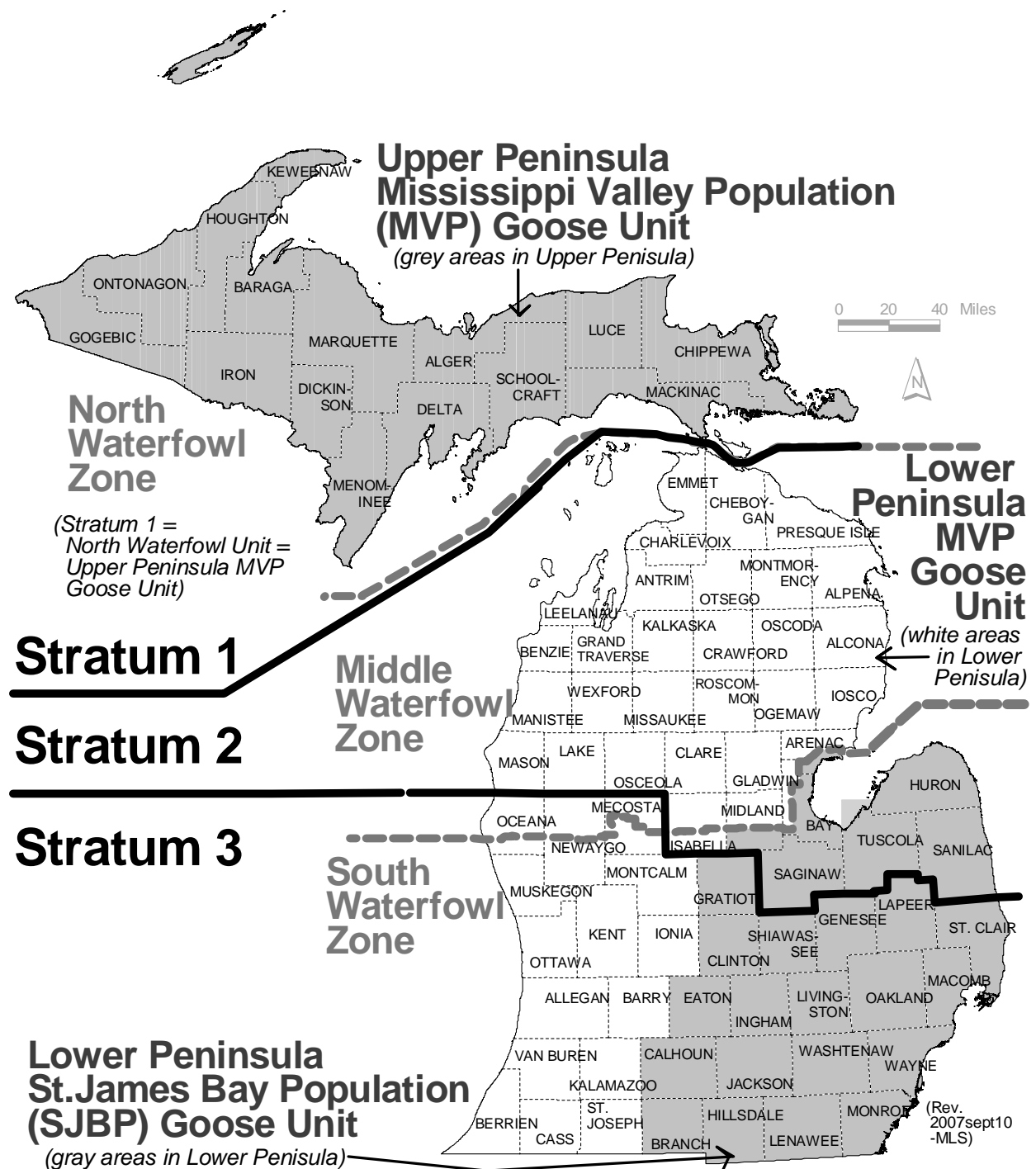


Figure 1. Areas (strata) used to summarize the waterfowl survey data for the 2006 waterfowl hunting seasons in Michigan. Stratum boundaries did not match the waterfowl management hunting zones.

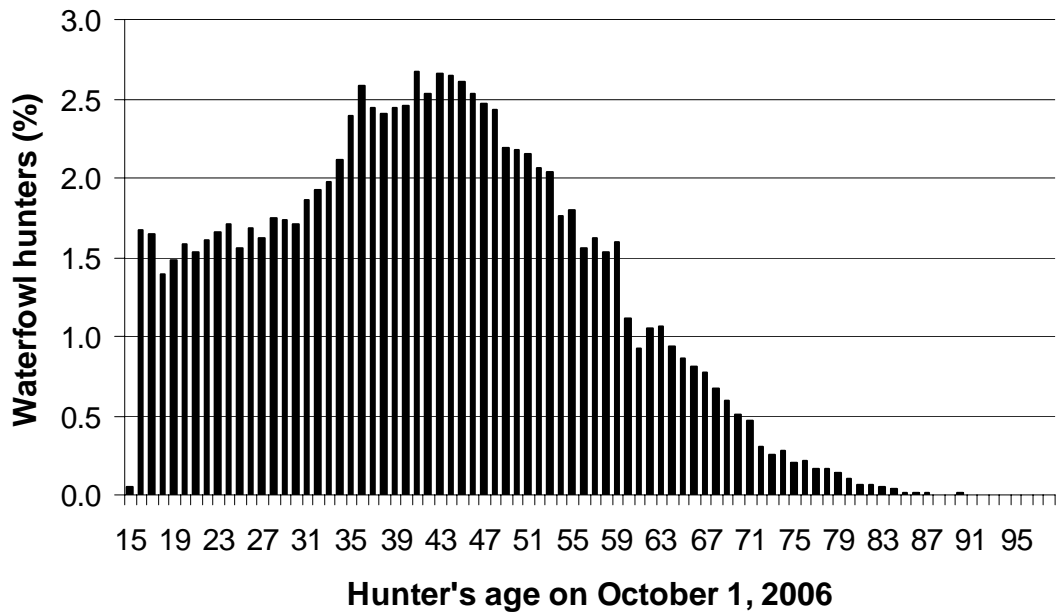


Figure 2. Age of people that purchased a waterfowl hunting license in Michigan for the 2006 hunting seasons (\bar{x} = 42 years). Hunters 10-15 years of age could legally hunt waterfowl without a waterfowl hunting license.

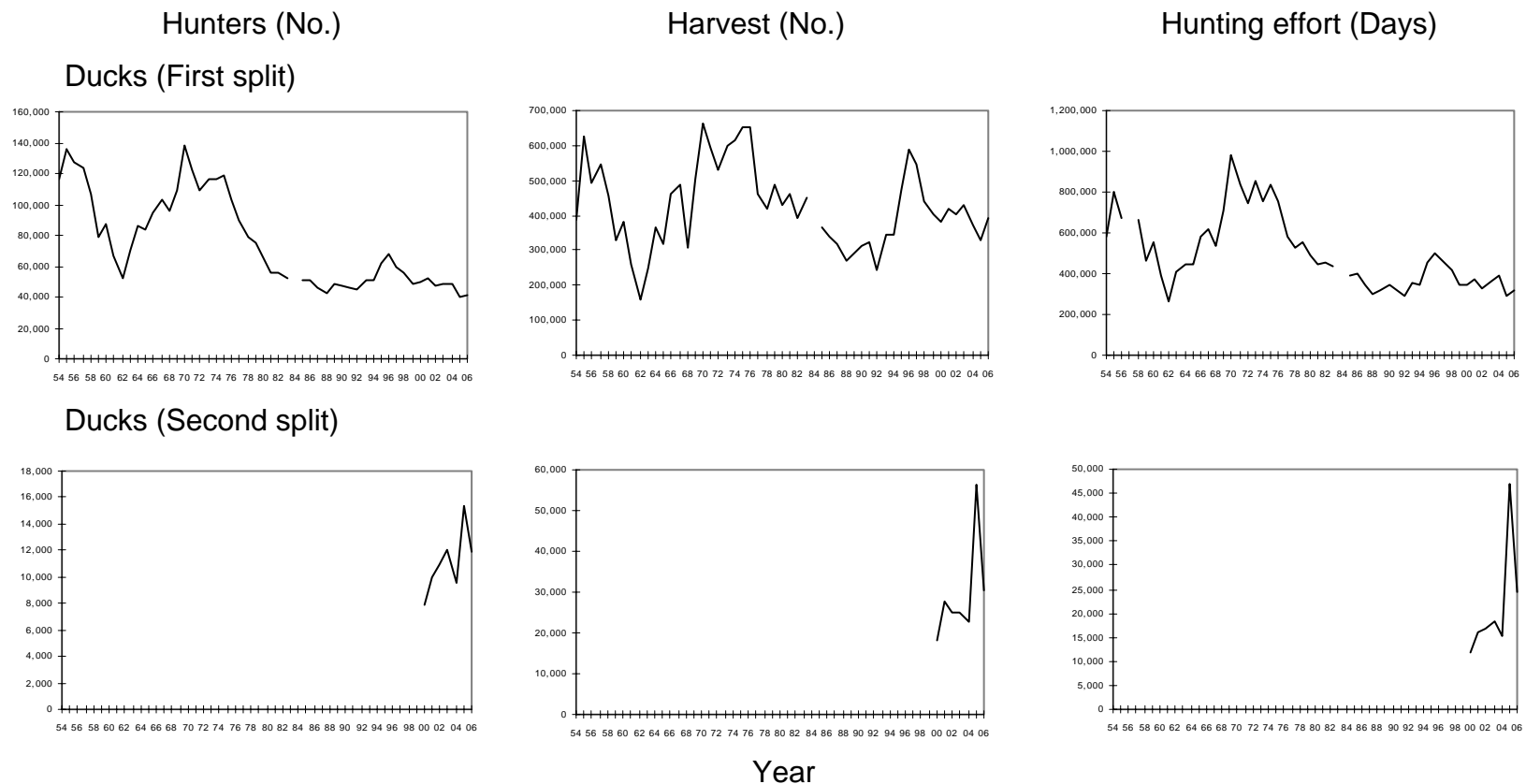


Figure 3. Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2006. No estimates were available or no seasons existed during years when no data are plotted.

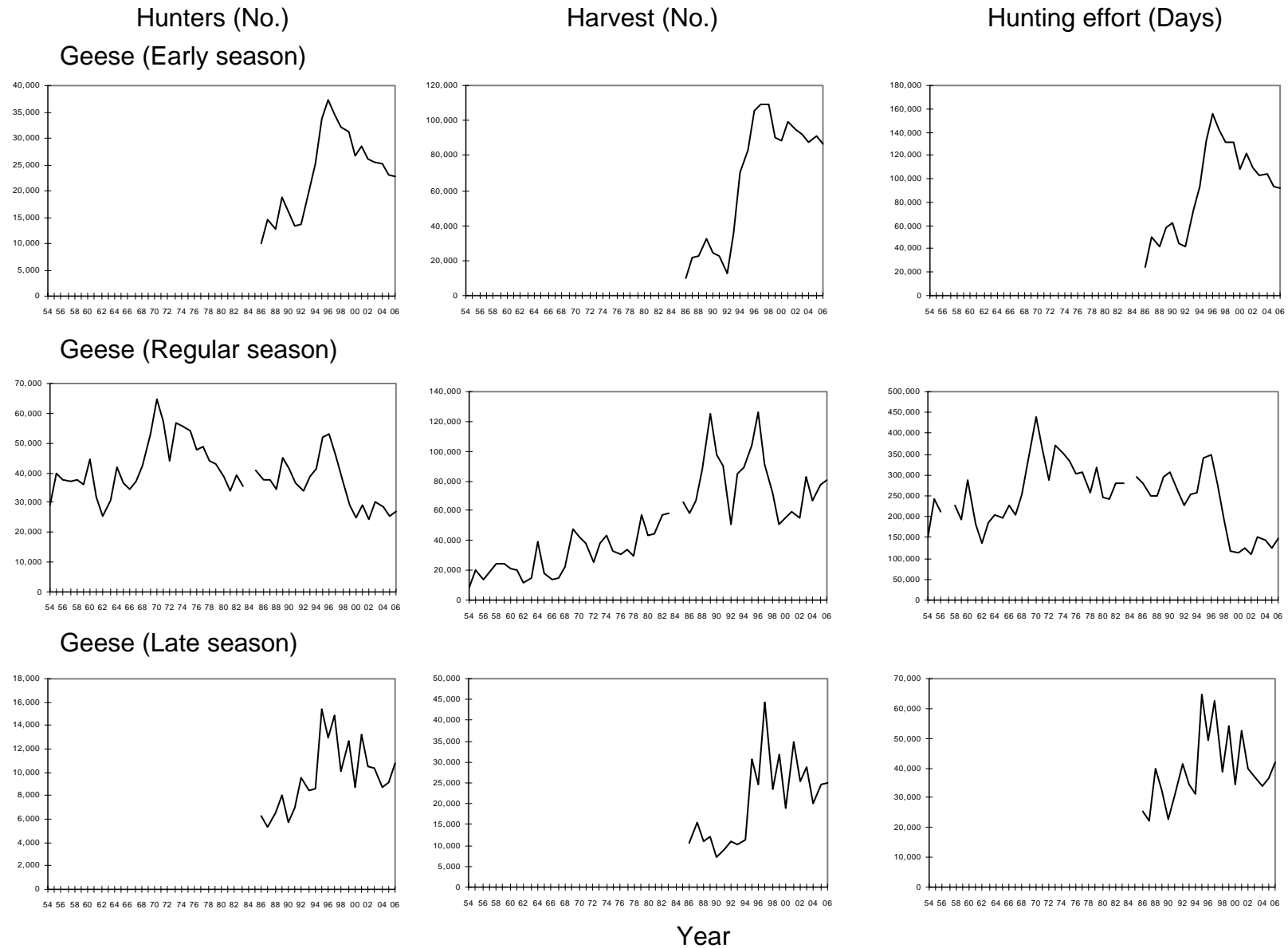


Figure 3 (continued). Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2006. No estimates were available or no seasons existed during years when no data are plotted.

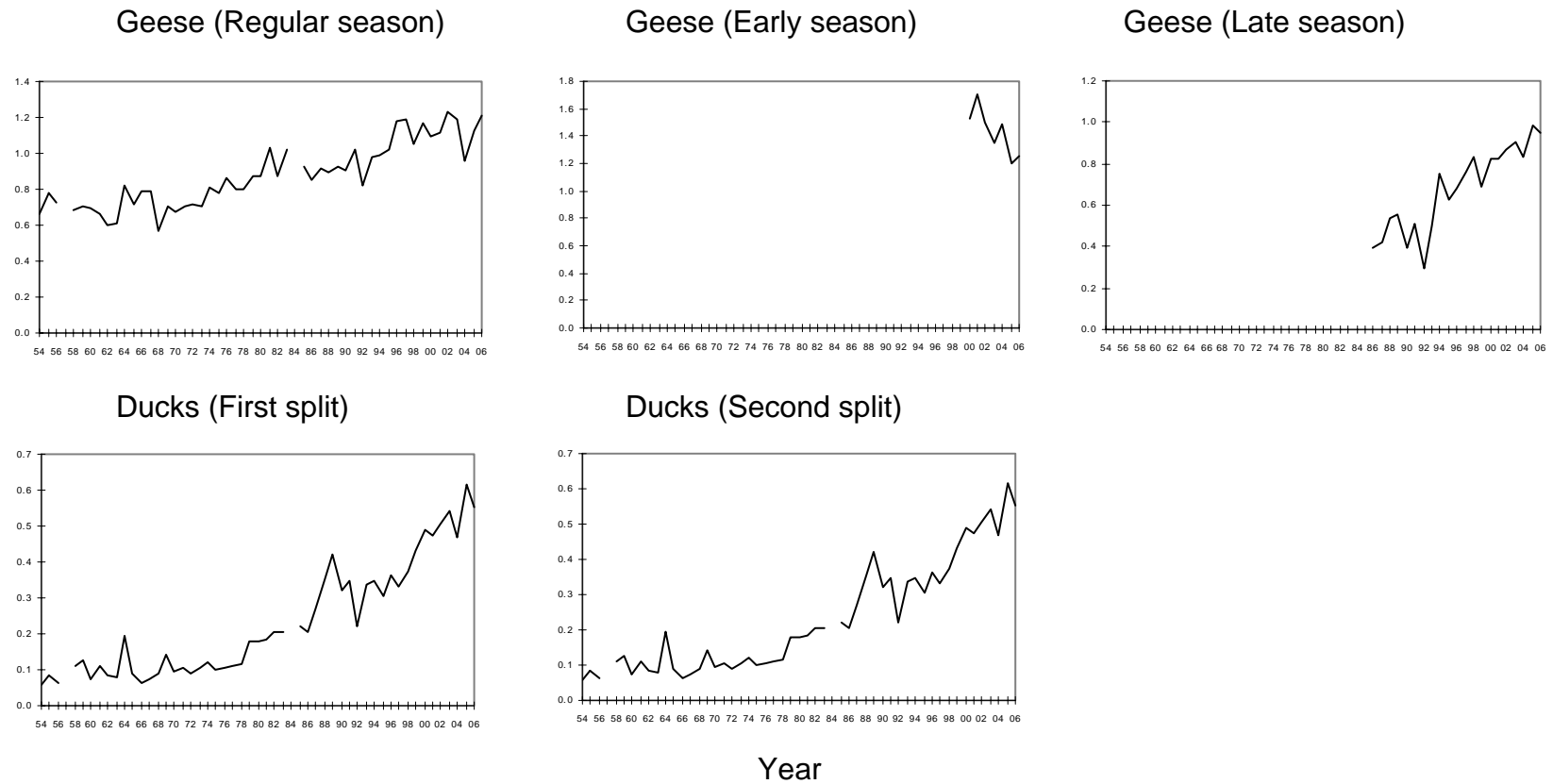


Figure 4. Estimated harvest per effort in Michigan during the waterfowl hunting seasons, 1954-2006. No estimates were available or no seasons existed during years when no data are plotted.

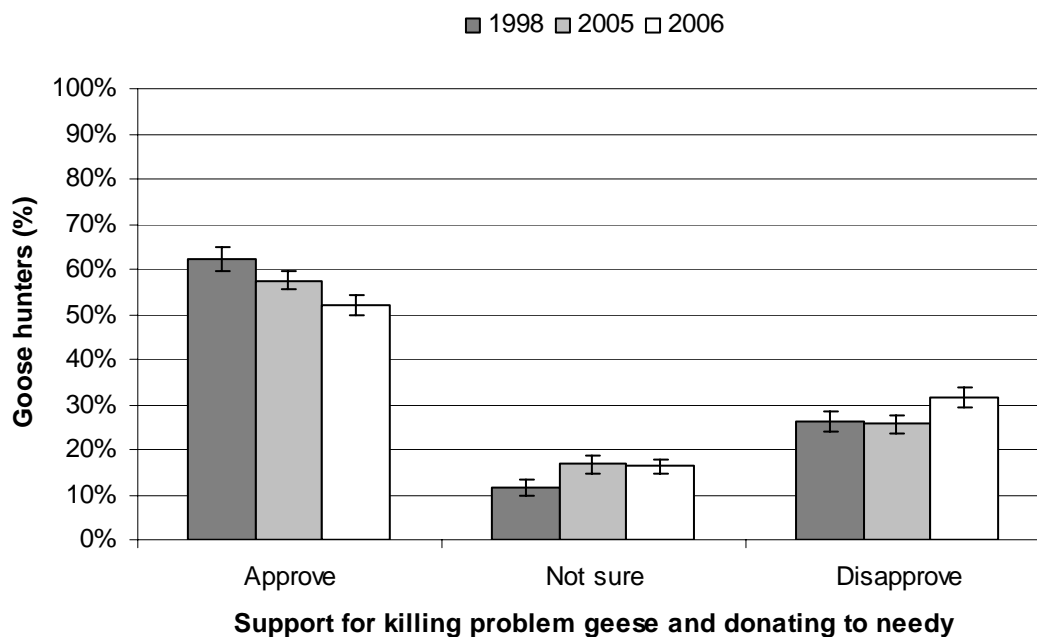


Figure 5. Proportion of goose hunters that supported killing adult geese in areas with problem geese and donating to families in need in Michigan, summarized by year.

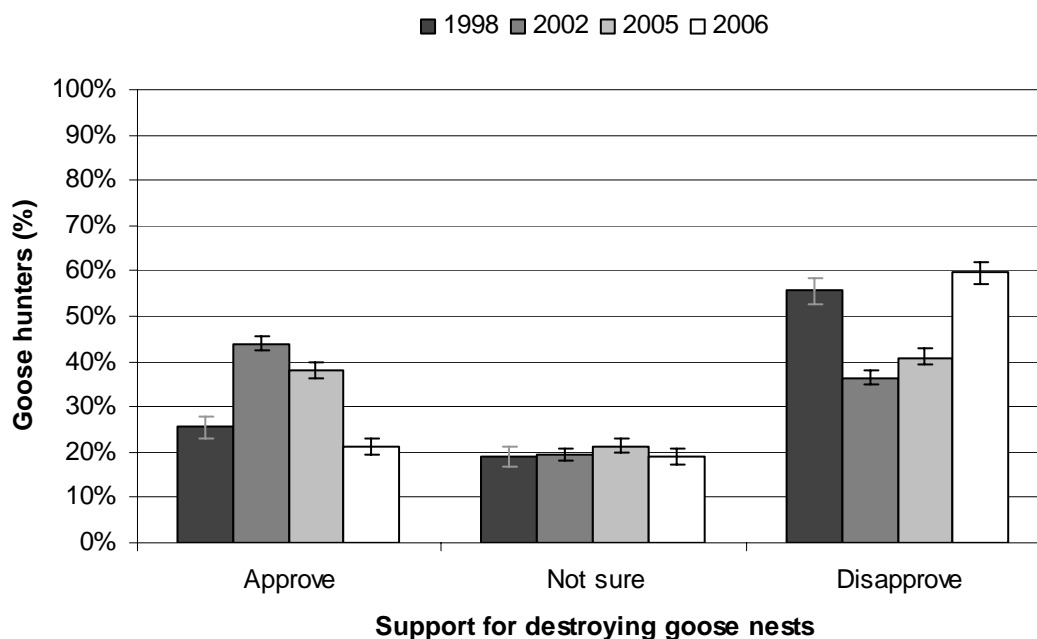


Figure 6. Proportion of goose hunters that supported destroying goose nests in areas with problem geese to lower their reproduction in Michigan, summarized by year.

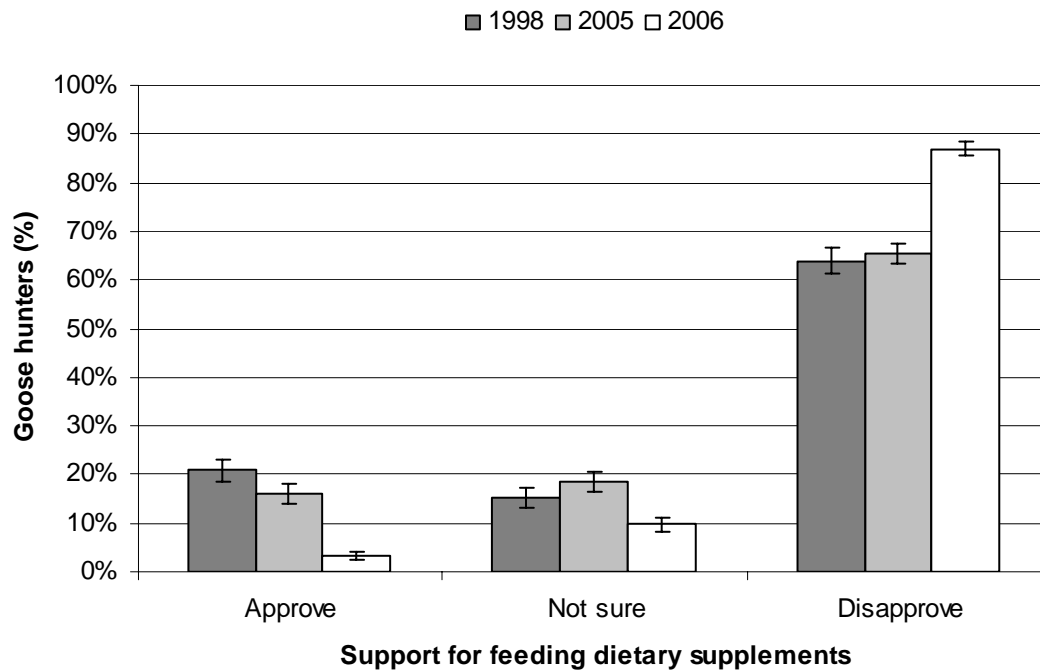


Figure 7. Proportion of goose hunters that supported feeding dietary supplements to geese in areas with problem geese to lower their reproduction in Michigan, summarized by year.